

## REDEFINING RURAL SUSTAINABILITY IN THE SECOND MACHINE AGE

**Tony SORENSEN**

*University of New England, Armidale, NSW 2351, Australia, tony.sorensen@une.edu.au*

**Abstract:** The arrival of the Second Machine Age will rewrite how rural geographers understand the nature of sustainability and the weightings accorded its various dimensions. Fast changing technologies, accompanied by the rise and decline of various economic sectors and their employment, will force rural communities to become much more adaptable and innovative in economic terms compared with the past. Moreover, many rural communities may encounter difficulties in realigning their psychologies and behaviours to the needs of innovation on account of sparse populations which attenuate the mutual support and networking that is crucial to the development of business ideas and their subsequent funding. Reasons are advanced as to why central governments are increasingly vacating the local development field and handing it back the development task to often ill-prepared local governments and groups of local activists. We conclude that a whole-of-community approach with strong leaderships may be needed to re-orient rural communities to the future.

**Keywords:** Sustainability, technological change, innovation, adaptation, government roles, private sector

### 1. INTRODUCTION

In the words of Jack Welch, former CEO of General Electric: “Change before you have to face reality as it is, not as you wish it to be. Control your own destiny or someone else will. If you don’t have competitive advantage, don’t compete, and if the rate of change on the outside exceeds the rate of change on the inside, the end is near”.

These quotations are a metaphor for the contents of this thought piece, and their message is simple. We are on the cusp of a turbulent economic and social era over which we have little and decreasing control and, if we fail to keep pace with the speed of change, the sustainability of many rural communities is under threat. In much of the commission’s work, the idea of sustainability embraces ecology, environment, culture, society, lifestyles and only to a smaller extent economic productivity – for example the maintenance of long-term agricultural output. But, as former US President, Bill Clinton, put it pithily, “it’s the economy, stupid”. In other words, we should pay most attention to sustained and efficient production over the long term, a task that is fraught under massive economic and social uncertainty driven by

stampeding technology. Very simply, if we don’t have jobs – and satisfying ones, communities are unlikely to survive. Our task in this chapter is therefore to sketch the impending tsunami of change and uncertainty and assess its possible impact on rural society, before asking how rural communities might better manage their transition to a new world order.

### 2. AN ECONOMIC TSUNAMI

After a decade or so of the Second Machine Age (SMA) we are entering a world of accelerating technology allied to processes of enormous uncertainty and rapidly rising complexity (Brynjolfsson & McAfee, 2014; Hammersley, 2012; Rawlings et al., 2013). In the coming 35 years to mid-century the SMA will likely transform economy, society and environment as dramatically as the two centuries or so of the industrial revolution, but many times faster. If pundits are right and Australia’s average per capita GDP growth, by way of example, accelerates into the 3-4% range, the economy’s size could triple in real terms by 2050. Contrast that with the roughly 18 centuries between the reign of Julius Caesar and the arrival of

Newcomen's steam engine in the early 18th century, when per capita GDP only doubled. So we are on the cusp of a very large wave.

The principal driver of change over this time-period will be many different elements of science and technology, whose general scope can readily be documented (Tab. 1). None of these exists in isolation and the pace of change will be accelerated by processes of technological fusion, blending and integration discussed by the authors already cited. By taking technologies A and B and fusing or blending them we will often create unanticipated hybrid technologies, which may be more powerful than either A or B separately and, in this way translate Moore's Law, which forecast almost perfectly the doubling of the processing power of semiconductors every two years, into many more realms. In essence we will generate an ever rising technological soufflé. For example, the emergence of smart farms or smart homes is based on this notion of technological fusion. Moreover, most technological advances and their application are likely to be largely unstoppable by governments, businesses, and wider society – technology has a life of its own.

Another overlapping dimension of economic change and uncertainty will stem from the constellation of interacting forces listed below, all of which are likely to make our economic environments more complex, fast changing, and uncontrollable:

1. Rising global interconnectedness of production systems.
2. Competitive pressures from multiple global polarities – EU, NAFTA, ASEAN, APEC, BRIIC nations.
3. Risk of innocent third parties like Australia being subject to contagion from government corporate and financial maladministration in other jurisdictions. Taleb (2007) rose to fame in diagnosing precisely this theme.
4. Social fragmentation (multi-class societies reflecting not just divisions based on income and wealth, but on age, family status, lifestyle preference, risk profiles). As of early 2013, Britain was diagnosed with seven distinct classes; perhaps all future Australian governments are on the brink of becoming uneasy coalitions (Savage et al., 2013).
5. International struggle for scarce resources: minerals, agricultural land, energy, water.
6. Increasing mobility of national and global workforces; by 2050 Hispanics will be the dominant ethnic group in the USA and Australia will be polyglot.

7. Unexpected tipping points in unstable systems – demographic, productive, environmental, resource, corporations (Diamond, 2005).
8. Complexly intersecting economic cycles (business, banking, investment, fashion, or product); We don't have a two-speed economy as pronounced by Glen Stevens – Governor of Australia's Reserve Bank, but maybe a 6-speed economy (Sorensen, 2011b).
9. Entrenched failure of legal and constitutional systems to adapt sufficiently fast to emerging realities.
10. The emerging paradox of increasingly poor data amidst a glut of information. Fast-moving technology and society rapidly invalidate much information we already hold, while rising system complexity often means we do not hold data on emergent and important links between previously unimportant variables and trends. On the other hand, big data is generating huge amounts of information while we lack effective algorithms to sort out the good from bad (Gigerenzer, 2014; Pentland, 2014).

### 3. POSSIBLE OUTCOMES

The opportunities and threats posed by intersecting technology, uncertainty and complexity are potentially huge and underappreciated. Such elements also interact in murky, cumulative and often unanticipated ways (Rawlings et al., 2013), with spatially peripheral ruralities especially likely to be slow in their recognition and development of avoidance strategies (Hägerstrand, 1967). Hägerstrand's ideas are still relevant to many small service enterprises which struggle to keep pace with their metropolitan counterparts, but much less so to the rural economic base of agriculture and mining where large scale of operations and export orientation foster fast up-take of new technologies. In contrast, isolation means that many rural service providers score fairly poorly on entrepreneurial capacity.

Both uncertainty and complexity also suggest that past notions of spatial planning based on drawing up specific blue-prints for regional futures are no longer viable (Prechter, 2003). We can no longer envisage accurately the evolution of rural society over even the medium term up to ten years from now. However, we might detect some general trends much as Lem (1985) does in his wonderfully creative novel or along the lines of work by Heck et al. (2014), Rawlings et al. (2013) and Hammersley (2012). Such work requires informed imagination.

Table 1. Major dimensions of evolving science and technology

Enhanced ICT, including big data	Quantum computing + brain simulation
Bio-medical (cures for many common diseases; genetic modification advances)	Transport (e.g. driverless cars and trucks or Elon Musk's vacuum tubes) + aerospace
Robotics / Artificial General Intelligence – in just about everything	Renewable energy generation and especially storage using new battery technologies
New materials (light weight, high strength, anti-corrosive, good malleability, etc.) like graphene and stanene	E-tailing and e-governance
Automated construction techniques (e.g. DIRT in Calgary, Canada)	Smart everything: agriculture, mining, homes, vehicles
Human augmentation (wearable ICT)	Synthetic foods (chemical cuisine including meats, milk, proteins, fibres)
3-D printing	<i>Source: the author</i>

Maybe 50% of all current jobs will disappear or be modified radically over the next 25 years, many in education, retailing and distribution, construction (much of whose technology is centuries old), transport (with the arrival of driverless vehicles), farming, and so on. Many, though not all, job losses will be of the repetitive kind, which can be replaced by sentient machines; hence the term: 'Second Machine Age'. Losses or re-definition of employment will be made up readily by (a) new occupations, (b) increases in professional and technical, engineering jobs, and (c) increasing service employment. It also seems likely that rising workforce skill need, accompanied by losses of jobs in many less skilled occupations will drive expanding income inequality within and between regions, an issue that will require careful handling (Brynjolfsson & McAfee, 2014).

There is no reason to suspect that losses and gains will be spatially coterminous. As in the industrial revolution, some regions will experience major in- or out-migration and therefore potential gain or loss in adaptive capacity. Coming generations (including so-called Millennials) will generate a large diversity of new residential and lifestyle preferences and associated social friction. Urban forms that work now may not work then.

Within rural regions or communities, their impending economic and social transition will be hugely affected by local adaptive capacity, which has two major component dimensions:

1. Anticipating – or indeed leading – technological, economic and social trends, and
2. Finessing the downsides of such trends, while actively pursuing the upside potential of opportunities arising – e.g. using Taleb's (2012) optionality process conceived for small businesses.

From Pentland's (2014) perspective these two

dimensions can be rewritten another way:

1. Generate ideas and
2. Adjust local cultures to facilitate those ideas fast.

Adaptation in this emerging world is the only path forward in facing an avalanche of technologies in a looming environment of uncertainty and complexity. Local Government will unavoidably be caught in the maelstrom and, from a development perspective, will be seeking to help insulate their communities from adverse effects, while capturing the waves of opportunity floating by. So, a prime target of local government support has to be honing adaptive capacity. This implies substantial revision of Australia's (Daley, 2012) and many other nations' agendas for, and practice of, regional development.

As Daley (2012) observes, the last half a century of Australia's stuttering *nominal* regional policy we have seen:

1. Decentralisation based on manufacturing.
2. The selection of some regions as growth poles or new cities.
3. Big and small infrastructure projects (dams, railway lines, ports, National Broadband Network, community facilities of various kinds).
4. Leadership programmes.
5. Competitive small grants for communities / businesses.
6. (Often competing) Regional organisations of various kinds.
7. Financial taps turned on and off repeatedly, but always insufficiently funded.
8. Generation of viable industry clusters, and
9. Pursuit of business adaptation.

Most of these strategies have been orchestrated by superior tiers of government – the federal government and the states. But the effectiveness of all this, as measured by the impact on regional economic trajectories relative to a free-

market setting, appears to be very little! And such strategies appear to have even less relevance for adapting to a flood of new technology in an age of uncertainty – a flood that is possibly best addressed by culture change at the local level.

#### **4. TOWARDS A NEW AGENDA**

Put another way, the private sector is overwhelmingly the generator and developer of new technologies. And, if regional economic futures increasingly hang on the productivity and competitiveness of their businesses in a high-tech world, we need to know what drives the discovery, adoption, and evolution of technology to understand and manage adaptive capacity. A vast body of literature boils this down to six intersecting component conditions: Funding, Talent, Support, Mindset, Trendsetting, and Diversity. These are what make the technology hubs of Silicon Valley, Tel Aviv, Boston, Los Angeles and New York hum (Conventz et al., 2013) and likely our rural regions! To those conditions we might add the quality of amenity (Argent et al., 2013). Kotey & Sorensen (2014), using material from a recent research project concerning Australia's cotton industry, illustrate some of the obstacles to innovative behaviour that exist in many rural regions.

##### **4.1. Funding**

Funding is everything. Innovation and adaptation are difficult without access to venture capital. But Australia has a venture capital funding problem in general and the large private banks are wary of funding start-ups or small and medium enterprises (SMEs). At the regional level some crowding-funding schemes exist (such as Pozible) and a few credit unions – acting like Abdul Yunus' Grameen Bank – provide seed-funding capital very much like the revolving loan funds in part of the United States. But rural Australia lacks specialist venture capital funds of the kinds flourishing in the San Francisco bay area. Sydney, in contrast, has Seed Fund, Deep Value Microcap Fund, OneVentures, Yuuwa Capital, and Blackbird Ventures (Morle et al., 2014), but their spatial horizons tend not to embrace rural Australia. We also know relatively little about business capital needs and supply in non-metro regions for which urgent research is needed. Personal discussions with many organisations working in regional Australia suggest that few, if any, places are working on enhanced risk capital availability.

##### **4.2. Talent & support**

Successful innovation requires numerous abilities including scientific and technological literacy, numeracy, entrepreneurship and financial nous, engineering and trades skills, and creativity and imagination. Deficiencies in any of these can be rectified to a considerable extent by mutual support from like-minded people, formal business advisory services, and broad networking across the business community. Again, not many of Australia's communities are actively developing best practice on these dimensions.

##### **4.3. Mindset & trendsetting**

Ideal regional mindsets are future oriented, inquisitive, open to ideas, risk accepting, integrating, receptive of criticism, and undeterred by failure. Such abilities are circular and cumulative on a broad community basis. As more people adopt such psychological cultures – especially those focusing on creativity (Sorensen, 2010; Catmull, 2014), so even more are likely to embrace this line of thinking. And leading the charge will be trendsetters. Those people who are willing to break with the past, intensely scan options (or opportunity sets), are action-oriented (but considered action after optionality analysis), and strive to be first in the field with an idea to gain first mover advantage. Long observation suggests that few of our rural regions or localities attempt to hone these skills.

##### **4.4. Diversity**

A large literature suggests that diversity of opinions, attitudes, approaches, industry sets / clusters, and lifestyles assist innovation through the clash of contrasting ideas, information and behaviours (Florida, 2004; Jacobs, 1961). Forget the mantra that we must develop and stick to a single strategy – almost always dated before the ink is dry. All the successful innovative regions in the world thrive on the contest of ideas in an open society.

All six components are heavily interconnected along with a seventh which I nominated earlier – amenity, which includes environmental quality, recreational opportunity, and lifestyle possibilities. These components should be as relevant to rural regions as the world's technological hubs, but in many countries that I have visited in connection with my work for the IGU Commissions on (a) the Sustainability of Rural Systems and (b) Local and Regional Development this often appears not to be the case. In a few exceptions like Australia and

Canada, where agriculture is often cutting edge in a technological sense, highly innovative, and large-scale, the industry operates on a basis not dissimilar to Silicon Valley (Sorensen, 2011a). Agriculture receives very little public support compared with many countries, so if you're on your own as a farm enterprise, one's commercial survival depends upon constant adaptation using all the latest technologies available. Australia's farm support lies therefore in public and industry co-funding of R&D through Cooperative Research Centres (CRCs), Rural Industries Research and Development Corporations (RIRDCs), CSIRO, Universities and government Departments of Primary Industries. This model is predicated on likely market failure to deliver private rural R&D where large numbers of relatively small enterprises (farms) producing a wide range of commodities are geographically separated and unable to come together with sufficient research funding. All of Australia's rural research organisations have charters requiring effective dissemination of new science and technology from the laboratory to the farm gate via field days, agricultural shows, or more recently electronic interaction. Sorensen (2011a) and the Productivity Commission (2005) demonstrate how effective this system is at sustaining innovation and agricultural best practice.

Multifunctionality is another path to sustainability in Australia, as elsewhere, and it is exemplified in the behaviour of hobby farmers. They sometimes run substantial operations by, say, European standards, but because of substantial off-farm income can focus more on environmental issues. This said, 80% of the profits from Australian agriculture come from just 20% of producers and those large-scale corporatist operations overwhelmingly dominate the volume of production, especially in locations remote from large urban agglomerations.

So farms are becoming a bit like car assembly lines, and attracting corporate interest in all phases of production: supplying inputs, commodity production, harvesting and processing, and distribution:

1. Machinery / robotics suppliers manufacturers & operators
2. Genetic engineering
3. Chemicals & fertilisers
4. Energy suppliers / managers
5. Expert systems and financial engineering
6. Transport and logistics
7. Water management
8. On-farm R&D among larger scale producers
9. ICT, etc.

This said, one would expect a priori that the paths to innovation and adaptability would differ between city and country with different priorities, strategies and behaviours reflecting local circumstance. Alas, most rural regions generally lag capital city locations on each of the seven themes discussed earlier. It is easier to develop such strengths in large densely knit communities where residents and businesses are in close proximity. Mind you, my home town (Armidale, NSW) ranks ninth out of Australia's 360 local government areas in the Regional Australia Institute's competitiveness index, and it is now actively trying to leverage and assist innovative start-up ventures. But Armidale is a huge exception to the bulk of rural Australia in that a major research-oriented university contributes 40% of the local economy. It is also the first place anywhere on the continent to be completely serviced by very high speed broadband internet.

## 5. RAISING ADAPTIVE CAPACITY MORE GENERALLY

Whose task is it to promote adaptive capacity more widely to all other industry sectors, and how might it best be done? Let's start on an upbeat note; the task is potentially getting easier as ICT and many other technologies now permit a much wider range of business opportunities in regional Australia by reducing the friction of distance in some cases to zero. By way of example, the world's first internet florist business was founded in Armidale. And our city now has a dynamic 'white hacking' business with business clients scattered both in Australia and overseas (white hacking occurs when a company or government hires a 'friendly' computer hacker to deliberately penetrate their defences and point out weak spots where work is needed to raise security). Other technologies with this potential capacity seem to be 3-D printing, energy production, genome sequencing and a few others.

While the federal and state governments mostly promoted local development over the last 50 years, this era seems to be passing. National governments in most countries are increasingly less concerned with the welfare of specific places, but managing an efficient, productive and competitive national economy as free as possible from:

- Cyclical booms and busts,
- Economic distortions favouring one class of industries over others,
- High burdens of taxation,
- Shortages of low-cost investment capital,
- The scourges of graft, fraud and corruption, and

- Excessive regulatory burden.

Collectively these amount to creating favourable business investment environments aided by adequate low-cost capital available to all sections of the business community from corporations to start-ups. Supplementary to this is oversighting sufficient good quality contemporary infrastructure and delivering adequate workforce skill-levels. This complex series of interrelated tasks increasingly has both domestic and international dimensions, not forgetting the need to balance intergenerational interests – itself a highly complex issue. This leaves little leeway to massage the development interests of various places. For the most-part this agenda is *spatially blind*, except for perhaps the fiscal equalisation work many nations pursue. Examples of this approach include Australia, Philippines, and Vietnam. This may seem like a neo-liberal agenda, but creation of a favourable business environment was, in Australia's case, cemented in place by a left-wing government whose prime minister was formerly head of the trade union movement!

Australia's state (or provincial) governments are pre-eminently service providers for their jurisdictions: for example, infrastructure, health, education, and business advice often allocated spatially on the basis of assessed present or likely future need or of community service obligations. They are also preservers of amenity through urban planning and environmental regulation. Some states or provinces also pursue fiscal equalisation at the local level. Much of this work is *spatially connective*.

Local governments deliver local infrastructure services (e.g. roads, water, sewerage, libraries, art galleries and theatres) and have delegated authority over local aspects of urban and environmental planning. Thus they are *spatially focused* and attuned to local talents, resources, opportunities, cultures, mindsets – many of the components of the adaptive agenda noted earlier. And, indeed, many of Australia's larger local governments – in terms of population size – recognise their local economic development role by appointing economic development staff focusing on tourism or industrial attraction and support. These formal responsibilities of local government are usually somewhat inconsistent with the emerging behavioural dimensions of the adaptation task. In a world of galloping technological invention and business innovation afloat in a sea of great uncertainty and complexity, that task is becoming more akin to:

- Laying one's community down on the psychologist's couch and
- Manipulating local behaviour sets to make them

more future oriented; inquisitive; creative; innovative; imaginative; open to ideas; risk accepting; or integrative (the mindset component).

These are in addition to ratcheting up the quality of business advice necessary for high technology start-ups and developing local pools of start-up capital and encouraging diversity.

In short, we're entering a new ball-game, but one with little or no track record outside of the world's metropolitan cores. Nor is this agenda restricted to local government alone. It is a whole of community affair, networking (1) scientists, technologists and engineers, (2) entrepreneurs, business leaders, and such business organisations as chambers of commerce, (3) universities (if you're lucky enough to have one) and technical institutions, (4) the leaderships of social institutions, (5) wealthy individual philanthropists and business angels, and (6) media interests. Networking here means nearly everyone talking to everyone else to deliver a sizeable pool of future oriented people keen on surveying technological developments, adapting them to local circumstances (needs, opportunities, and inclinations), making investments in start-up enterprises, and running them effectively. This is not the direct province of higher tiers of government – it is a local task, which requires high order local collective business, institutional and civic leadership – preferably all three. I have met and admired many such people in my studies of local leaderships (Sorensen & Epps, 1996).

There is no prescription as to the roles that each member of the collective should perform or how they should perform those roles. They do not have to agree on much, except to have a continuing and vigorous exchange of ideas, which they convey to the wider community. They might well set up sub-organisations dedicated to:

- Securing venture capital funding,
- Stimulating groups of geeks to develop workable ideas,
- Creating business support networks to help every aspect of starting or running a company,
- Running forums to show-case new technologies, local adaptations of such technologies to new uses, debate future economy and society,
- Running creative workshops for all ages,
- Celebrating Diversity, and
- Increasing local amenity – my own seventh pivotal ingredient in creative and adaptive societies,
- I might add that mayors sometimes can and do

take a leading role in such activities – creating a sense of infectious excitement.

We, as a nation, have little track record in pursuing these strategies and need a lot of experimentation in trying to kick-start non-agricultural rural businesses, especially in Australia with its sparse population. It might be possible to network people in virtual space; we could experiment with Technology Festivals or TED style conferences; and we should better leverage start-ups from regional universities through technology transfer organisations (TTOs).

The world's rural regions in general also have limited experience in creating highly innovative and adaptive cultures – except perhaps in agriculture itself. Participants, agendas and strategies are likely to vary substantially according local resources / opportunities (i.e. they're likely bespoke). There is high potential for burn-out because the leadership task is intense and perpetual and it is likely to fall on relatively few shoulders. There's a lot of wreckage in the process. The failure rate of start-ups in Silicon Valley is c. 85% (less the second time around), but the successes are often monstrous when they occur and the learning experiences are valuable. Alas, Kotey & Sorensen's (2014) work on small business innovation in towns providing services to Australia's cotton industry shows how difficult it often is to develop creative cultures in rural towns whose population are less than 10 000 people.

Australia's local development is no longer a zero-sum game as it was in the days of decentralisation – back then your capturing an industry was someone else's loss. Today, creating something new is a positive sum game and how! Google started 15 years ago with two people Larry Page and Sergey Brin. Now the Mountain View HQ has 20 000+ employees and Sergey, a Russian immigrant (aged 41), is worth over US \$ 30 billion. Techno-cultures pay very well and bring great wealth to their communities – Silicon Valley never experienced the US recession brought about by the global financial crisis of the late 2000s. They are a magnet for young people and can help turn around the problem of ageing in rural society. Action generates experience and experience is the life-blood of our coming business environment, much more perhaps than conventional economic theory.

To ameliorate the problems and surf the upside we also need to assist smaller jurisdictions in remote locations by:

- Sharing experiences via web-sites, conferences, social networks, newsletters, etc. In Australia, such activities could possibly be supervised by the Regional Australia Institute and Economic

Development Australia or via private Apps (interregional learning);

- Developing the necessary cultures at a regional, and not just an LGA scale – orchestrated perhaps by groupings of local authorities or energetic local social groups like the Digital Economy Taskforce I belong to;
- Perhaps develop a research agenda via RIRDCs; and
- In these ways we might avoid reinventing the wheel.

## 6. CONCLUSION

Local Government has an important, perhaps lead, role to play in avoiding the hazards and grasping the opportunities of the SMA. But it has to share the stage as one key element in the community-wide endeavour of inventing and executing the future. How one plays the game is in many respects up to local initiative, but not to participate carries, I suspect, huge potential risks for the well-being of localities in question. It is difficult to see sustainable rural futures without high powered future orientation. "It's the economy, stupid" is a very important philosophy for local survival, but it has to obey other dimensions of sustainability – environmental, ecological, and resource management. The economic agenda is therefore an important partner in driving the future and Jack Welch's dictums are broadly correct!

Alas, the road-map to the future has few prescriptive markers and it is rather clouded in uncertainty, but it remembers the crucial importance of experience in refining activities (one should pay homage here to Michel de Montaigne, 1580, the philosopher of experience, who wrote his famous *Essais* several centuries ahead of their time. Both Taleb and I cite his work with approval). Non-participation reduces, if not negates, the prospects of gaining such experience about the avalanche or waves (the choice of metaphor is irrelevant) of uncertainty threatening to engulf us. Economic sustainability ultimately comes via doing! It is action oriented – almost uninhibited action – on the part of many. It also involves (a) co-operative, (b) competitive and (c) dissenting action – the ferment of ideas.

## REFERENCES

- Argent, N.M., Tonts, M., Jones, R. & Holmes, J., 2013. *A creativity-led rural renaissance? Amenity led migration, the creative turn and the uneven development of rural Australia*. Applied

- Geography, 44, 88-98.
- Brynjolfsson, E. & McAfee, A.,** 2014. *The Second Machine Age: work, progress and prosperity in a time of brilliant technologies*. Norton, New York, 306 p.
- Catmull, E.,** 2014. *Creativity Inc.: Overcoming the unseen forces that stand in the way of true inspiration*. Bantam Press, London, 368 p.
- Conventz, S., Derudder, B., Thierstein, A. & Witlox, F. (eds.),** 2013. *Hub Cities in the Knowledge Economy: seaports, airports, brainports*. Ashgate Publishing Ltd., Farnham, UK, 284 p.
- Daley, J.,** 2012. *Critiquing government regional development policies*. In: Pincus, J., Graeme, H. (eds.), *A Greater Australia: Population, policies and governance*. CEDA, Melbourne, pp. 212-222.
- Diamond, J.M.,** 2005. *Collapse: How Societies Choose to Fail or Succeed*. Penguin, Camberwell, Victoria, 608 p.
- Florida, R.,** 2004. *Cities and the Creative Class*. Routledge, New York, 208 p.
- Gigerenzer, G.,** 2014. *Risk Savvy: How to make good decisions*. Viking, New York, 336 p.
- Hägerstrand, T.,** 1967. *Innovation diffusion as a spatial process*. University of Chicago Press, Chicago, 350 p.
- Hammersley, B.,** 2012. *64 Things You Need to Know for Then, Place of publication*. Hodder & Stoughton, London, 448 p.
- Heck, S., Rogers, M. & Carroll, P.,** 2014. *Resource Revolution: How to capture the biggest business opportunities in a century*. Amazon Publishing, Seattle, 272 p.
- Jacobs, J.,** 1961. *The Death and Life of Great American Cities*. Random House, New York, 458 p.
- Lem, S.,** 1985. *The Futurological Congress: From the Memoirs of Ijon Tichy*. Mariner Books, New York, 156 p.
- Kotey, B. & Sorensen, A.,** 2014. *Barriers to small business innovation in rural Australia*. Australasian Journal of Regional Studies, The, 20, 3, 405-429.
- de Montaigne, M.,** 1580. *Essais*. Simon Millanges, Bordeaux, 362 p.
- Morle, P., Kitschke, Z., Jones, A. & Tanchel, J.,** 2014. *Silicon Beach: Building Momentum*. Deloitte Touche Tohmatsu Limited, Sydney, 28 p.
- Pentland, A.,** 2014. *Social Physics: how good ideas spread*. The Penguin Press, New York, 320 p.
- Prechter, R.,** 2003. *Socionomics: The Science of History and Social Prediction*. New Classics Library, Gainesville, GA, 952 p.
- Productivity Commission,** 2005. *Trends in Australian Agriculture*. Research Paper, Canberra, 170 p.
- Rawlings, C.R., Smith, J.R. & Bencini, R.,** 2013. *Pardon the Disruption: The Future You Never Saw Coming*. Wasteland Press, Shelbyville, Ky., 282 p.
- Savage, M., Devine, F., Cunningham, N., Taylor, M., Li, Y., Hjellbrekke, J., Le Roux, B., Friedman, S. & Miles, A.,** 2013. *A New Model of Social Class: findings from the BBC's Great British class survey experiment*. *Sociology*, 47(2), 219-250.
- Sorensen, A. & Epps, R.,** 1996. *Leadership and Local Development: dimensions of leadership in four Central Queensland towns*. *Journal of Rural Studies*, 12(2), 113-125.
- Sorensen, A.,** 2010. *The psychology of regional development*. *Australasian Journal of Regional Studies*, 16(1), 85-98.
- Sorensen, A.,** 2011a. *Australian Agricultural R&D and Innovation Systems*. *International Journal of Foresight and Innovation Policy*, 7(1-3), 192-211.
- Sorensen, A.,** 2011b. *Quantum Dreaming: the relevance of quantum mechanics to regional science*. *Australasian Journal of Regional Studies*, 17(1), 81-99.
- Taleb, N.,** 2007. *The Black Swan: The Impact of the Highly Improbable*. Random House, New York, 444 p.
- Taleb, N.,** 2012. *Antifragile: Things That Gain From Disorder*. Penguin, London, 519 p.

Received at: 20.01.2015

Revised at: 09.03.2015

Accepted for publication at: 11. 05. 2015

Published online at: 21. 05. 2015